BANK OF CANADA
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Working Paper/Document de travail
2015-3

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Bank of Canada Working Paper 2015-3

January 2015

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ISSN 1701-9397

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Acknowledgements

I thank Ben Fung, Gerald Stuber and participants at a seminar for useful comments on earlier versions of this paper.

Abstract

Beginning in 1864, in the United States notes of national banks were the predominant medium of exchange. Each national bank issued its own notes. E-money shares many of the characteristics of these bank notes. This paper describes some lessons relevant to e-money from the U.S. experience with national bank notes. It examines historical evidence on how well the bank notes – a privately-issued currency system with multiple issuers – functioned with respect to ease of transacting, counterfeiting, safety, overissuance and par exchange (a uniform currency). It finds that bank notes made transacting easier and were not subject to overissuance. National bank notes were perfectly safe because they were insured by the federal government. Further, national bank notes were a uniform currency. Notes of different banks traded at par with each other and with greenbacks. This paper describes the mechanism that was put in place to achieve uniformity. The U.S. experience with national bank notes suggests that a privately-issued e-money system can operate efficiently but will require government intervention, regulation, and supervision to minimize counterfeiting, promote safety and provide the mechanism necessary for different media of exchange to exchange at par with each other.

JEL classification: E41, E42, E58
Bank classification: Bank notes; E-money; Financial services

Résumé

Aux États-Unis, les billets émis par les banques nationales ont dominé le paysage des moyens d'échange à compter de 1864. Chaque banque nationale mettait ses propres coupures en circulation. De nos jours, la monnaie électronique présente de nombreux points communs avec ces billets. L'auteur décrit quelques enseignements applicables aux monnaies électroniques, tirés de l'époque où ces billets circulaient aux États-Unis. À partir de données historiques, il évalue la performance de ce système monétaire porté par de multiples émetteurs privés, en ce qui a trait à la facilité d'effectuer des transactions, à la contrefaçon, à la sûreté, à la surémission et à la parité de change (uniformité monétaire). L'étude montre que les billets facilitaient les transactions et n'étaient pas émis en quantités excessives. De plus, ils étaient parfaitement sûrs, car ils bénéficiaient d'une garantie du gouvernement fédéral. Ils formaient par ailleurs une monnaie uniforme; les billets des différentes banques étaient échangés à leur valeur nominale, aussi bien entre eux que contre les billets verts. L'auteur décrit le mécanisme mis en place pour permettre cette uniformité. L'histoire des billets des banques nationales donne à penser qu'un système reposant sur l'émission de monnaies électroniques par des entités privées pourrait également fonctionner correctement, à condition que les autorités publiques interviennent, réglementent et exercent une surveillance, afin d'atténuer le risque de contrefaçon, de promouvoir la sûreté et de fournir un mécanisme de convertibilité pour assurer la parité de change des différentes monnaies.

Classification JEL : E41, E42, E58
Classification de la Banque : Billets de banque; Monnaie électronique; Services financiers

Non-Technical Summary

Beginning in 1864, in the United States notes of national banks were the predominant medium of exchange. Each national bank issued its own notes. E-money shares many of the characteristics of these bank notes.

This paper, covering the period 1864–1914, reviews contemporary arguments for establishing the national banking system, and discusses similarities between national bank notes and e-money. It describes some lessons relevant to e-money from the U.S. experience with national bank notes. The paper examines historical evidence on how well the bank notes – a privately-issued currency system with multiple issuers – functioned with respect to ease of transacting, counterfeiting, safety, overissuance and a uniform currency.

The objective is to improve our understanding of the problems that existing and future privately-issued and governmentally-issued e-money systems might face and to determine what can be learned about the roles that regulation and supervision can play in improving the functioning of privately-issued e-moneys as media of exchange.

This paper finds that bank notes made transacting easier and were not subject to overissuance. National bank notes were perfectly safe because they were insured by the federal government. Further, national bank notes were a uniform currency. Notes of different banks traded at par with each other and with greenbacks. The paper describes the mechanism that was put in place to achieve uniformity.

The U.S. experience with national bank notes suggests that a privately-issued e-money system can operate efficiently but will require government intervention, regulation, and supervision to minimize counterfeiting, promote safety, and provide the mechanism necessary for different media of exchange to exchange at par with each other.

The final section of the paper suggests areas for future research.

1 Introduction

The institutions and technologies that exist in the world today differ from those that existed in the past. Nonetheless, there are many institutions and technologies in the past which bear enough similarities to those that exist today that there is much that can be learned from studying their history. One such case is the notes issued by private and government banks in the United States prior to 1933. These bank notes shared many of the characteristics of the financial instruments that are or would be classified as e-money, which, following Fung, Molico, and Stuber (2014), I define as monetary value represented by a claim on the issuer that is stored on an electronic device, issued on receipt of funds, and accepted as a means of payment by persons or entities other than the issuer.[1]

This paper is part of a research agenda to describe the lessons relevant to e-money that can be learned from a study of the U.S. experience with bank notes. The objective is to improve our understanding of the problems that existing and future privately-issued and governmentally-issued e-money systems might face and to determine what can be learned about the roles that regulation and supervision can play in improving the functioning of privately-issued e-moneys as media of exchange.

To state this research agenda somewhat differently, the question it attempts to answer is, Can a privately-issued e-money system, with appropriate regulation and supervision, operate efficiently? If the answer is yes, then the finding of this research can be used to make explicit what these regulations should be and how the supervision should be implemented. If the answer is no, then the question becomes, Should government be the sole issuer and completely supplant privately-issued e-moneys by making them illegal, or should it compete with private e-moneys to improve efficiency?

To carry out this research agenda, I present historical evidence from the United States on how well privately-issued and governmentally-issued bank note systems with multiple issuers functioned. For privately-issued bank note systems I also examine how they were regulated and supervised, as well as the role that regulation and supervision played and their effects on the functioning of these systems.

The United States experience with bank notes can be divided into three distinct periods. The first is the period from 1786 to 1863, when virtually every bank issued its own notes. This period is interesting for at least four reasons. One is that there were a large number of banks in existence, so there were a large number of distinct bank notes circulating simultaneously. Another is that bank supervision and regulation were done by the individual states. This led to diversity in the laws and regulations under which banks operated. This period is also interesting because, with only a couple of exceptions, there was a lack of organized note-clearing arrangements and a lack of insurance for bank note holders. The lessons from this period are described in Weber (2014).

The first period ends and the second period begins on 3 June 1864 with the passage of what is commonly known as the National Banking Act.[2] The banks established under

[1] According to my definition, Bitcoin is not considered to be an e-money because it does not have an issuer and thus is not a liability of the issuer. For that reason, Bitcoin and other virtual moneys with similar characteristics are not considered in this study.

[2] The actual full title of this act is An Act to provide a National Currency, secured by a Pledge of United States Bonds, and to provide for the Circulation and Redemption thereof. See United States. Congress

this legislation are called national banks, because they were chartered under the National Banking Act, not because they had a national presence. National banks were restricted to operating in the state in which they were located, and were not permitted to have branches in the state unless state chartered banks in the same state were permitted to have branches.

Almost all national banks issued bank notes, and after 1866, national banks were the only banks issuing notes. National banks are still in existence today although they no longer issue notes. The 1864-1914 period provides an interesting contrast to the earlier one for at least three reasons. First, national banks were uniformly chartered, supervised, and regulated by the federal government (the Comptroller of the Currency, which is part of the U.S. Treasury), rather than by the individual states. Second, national bank notes were insured by the federal government. Third, during most of this period the federal government played a key role in the clearing of national bank notes.

The third period begins in November 1914, when the twelve District Banks of the Federal Reserve System went into operation and began to issue their own, fractionally-backed notes. These notes circulated alongside the notes issued by national banks. Thus, this period allows the study of an economy with multiple privately-issued e-money-like media of exchange and a governmentally-issued one. Studying this period will shed light on the question of whether the government should be the sole issuer and completely supplant privately-issued e-moneys by making them illegal, or whether it should compete with private e-moneys to improve efficiency instead. The third period runs until approximately 1933, when national banks stopped issuing notes.

This paper covers the intermediate (second) period and proceeds as follows: section 2 reviews desirable characteristics of a monetary system set forth as proxies for the efficiency of a monetary system in my previous paper (Weber 2014). Section 3 describes the monetary system in place when the National Banking Act was passed. Section 4 presents some contemporary arguments for the establishment of the national banking system and the elimination of state bank notes. Section 5 describes national bank notes and argues they satisfy my definition of e-money given above. Section 6 briefly discusses the extent to which national bank notes addressed the problems of transacting with, and the counterfeiting of, state bank notes. Section 7 presents contemporary arguments for initially limiting the supply of national bank notes and then discusses why this restriction was later eliminated. Section 8 describes the arrangements that led to national bank notes being federally insured and describes how the insurance was funded. Section 9 describes the mechanism that led to national bank notes being a uniform currency. Section 10 argues that the experience with national bank notes shows that a privately-issued e-money system can operate efficiently, that the government will have to play a significant role for efficiency to be achieved and that the costs of the mechanism put in place to achieve uniformity of the currency will have to be borne by agents other than the users of the e-moneys. This section also discusses the fundamental differences between e-moneys and traditional moneys that should be taken into account when considering what constitutes an optimally-designed monetary system. The final section suggests areas for future research.

(1864).

2 Desirable Characteristics of a Monetary System

For this study, it would be desirable to determine the efficiency of bank notes as media of exchange. Unfortunately, the data are not available to undertake such a study. Instead, I propose to proxy efficiency by examining the extent to which the national bank note system achieved five desirable characteristics of a money used in my previous study of state bank notes (Weber 2014). These characteristics are:[3]

1. ease of transacting – a financial asset will be more desirable as a medium of exchange the easier it is to transport and the less often it either requires a seller to make change or requires the buyer to pay a higher price because of a lack of divisibility;

2. minimal counterfeiting – an extremely low level of counterfeiting or easy detection of counterfeits permits sellers to be relatively certain that they are receiving a valuable asset in exchange for their products or services;

3. high degree of safety – holders of a medium of exchange would like to be relatively certain that the financial instrument they are holding will store value and be acceptable in exchange when they want to use it to make purchases;

4. no overissuance – limitations on the supply of a medium of exchange are essential if it is to be valued or if it is to maintain its value over time; and,

5. uniform currency[4] – when there is more than one medium of exchange, it will be desirable if each can be exchanged one-for-one with any other regardless of the identity of the issuer, the location of the issuer, the location of the other issuer, the location in which the exchange is to take place, and the time at which the exchange is to take place. In other words, when there is more than one medium of exchange, it will be desirable if a dollar issued by A exchanges one-for-one with a dollar issued by B always and everywhere.

3 The U.S. Monetary System prior to the National Banking Act

Prior to the passage of the National Banking Act in 1864, the primary media of exchange were the notes issued by state banks and the gold and silver coins issued by the U.S. Mint. There was no governmentally-issued paper currency until 1861.

[3]My list of desirable characteristics for a money is somewhat different from that traditionally found in textbooks. For example, Mishkin (2009, 55) lists the desirable characteristics of a money to be easy standardization, wide acceptability, divisibility, ease of carrying, and not deteriorating quickly. These textbook characteristics are incorporated in the first four characteristics in my list. I have simply changed some of the labeling and done some rearrangement to make my list of characteristics a better set of criteria for determining how well bank notes performed as media of exchange. Further, since textbooks do not explicitly consider the case of multiple moneys, I have added uniform currency to the list.

[4]In Weber (2014), I called this characteristic par exchange. I have changed the terminology to coincide with contemporary usage. A more complete definition of what I mean by the term "uniform currency" is given in section 9.

The change in this situation with regard to governmentally-issued paper currency was a response to the Confederate shelling of Fort Sumter on 12 April 1861. To obtain resources to fight the Confederacy, on 17 July 1861 the U.S. Congress passed "An Act to Authorize a National Loan, and for Other Purposes." This Act authorized the U.S. Treasury to issue up to $50 million of non-interest bearing "notes of not less a denomination than fifty dollars." These notes were "payable on demand by the Assistant Treasurers of the United States at Philadelphia, New York, or Boston." Because of this redemption provision, these notes were referred to as "demand notes." Even though these notes were receivable in "payment of public dues," they were not made legal tender.

The Civil War meant that there was a high demand for gold. The issuance of demand notes led to a drain on the Union's gold holdings that it would need to fight the war. As a result, the Treasury stopped redeeming these notes on 28 December 1861.[5] However, the need to finance the Civil War continued. The U.S. Congress, therefore, passed a second law authorizing the issuance of another paper currency to substitute for the demand notes. This law was "An Act to authorize the Issue of United States Notes, and for the Redemption or Funding thereof, and for Funding the Floating Debt of the United States." It was passed on 25 February 1862. It authorized the issuance of $150 million of non-interest bearing "United States Notes." These notes were to be "receivable in payment of all taxes, internal duties, excises, debts ... due to the United States, except duties on imports, and of all claims and demands against the United States ... except for interest on bonds and notes, ... and shall also be lawful money and a legal tender in payment of all debts, public and private." The important difference between these notes and the demand notes is that there was no provision for these notes to be redeemed in specie.[6] Because the United States Notes were made legal tender, they were sometimes referred to as "legal tender notes." More commonly, they were and are referred to as "greenbacks" because of their design, which is similar to that of the notes issued by Federal Reserve Banks today. Further, since greenbacks were designated as "lawful money," National Bank notes could be redeemed with them from the inception of the National Banking Act.

Thus, in 1864 when the National Banking Act was passed, the United States was on a mixed fiat-bimetallic money system.[7] Greenbacks were the primary governmentally-issued media of exchange in the country, but they were not redeemable in gold or silver. Gold was still legal tender and there were some gold coins in existence, but Friedman and Schwartz (1963) argue that gold was used primarily for foreign exchange purposes. Greenbacks and gold circulated at a floating exchange rate against each other.

This situation of one fiat currency (greenbacks) and one commodity currency (gold and silver coins) lasted until 1 January 1879, when greenbacks were made redeemable for gold at the old parity of 23.22 grains of pure gold per dollar. Redemption at the old parity on

[5]Date of suspension taken from *Annual Report of the Comptroller of the Currency*, 1875, XI. The suspension of specie payments was said to be "general."

[6]The notes could be redeemed for U.S. government bonds with a 20-year maturity paying 6 percent interest semi-annually.

[7]The National Banking Act superseded the "An act to provide a national currency, secured by a pledge of United States stocks, and to provide for the circulation and redemption thereof" (usually referred to as the National Currency Act), approved 25 February 1863. According to Friedman and Schwartz (1963, 18), the National Banking Act was passed to remove "defects" in the National Currency Act that kept national banks from being established.

this date was provided for by the Resumption Act of 14 January 1875. Resumption went off without a hitch. Thus, at the beginning of 1879 the United States returned to the bimetallic monetary system that existed prior to the suspension of that standard on 28 December 1861.

4 Arguments for Establishing the National Banking System

There two generally accepted reasons as to why the national banking system was established. The first is that it provided the Union with an additional means of financing the Civil War. The other, which is more relevant for this paper, was dissatisfaction with the lack of safety of state bank notes and the desire to provide the country with a uniform currency, which state bank notes did not provide because of the location and time-varying discounts on them.

In a letter to the House of Representatives on 1 December 1862, President Abraham Lincoln described the problems with state bank notes and the benefits of having notes issued by banks similar to those that would be issued by national banks under the National Banking Act:

> These notes, prepared under the supervision of proper officers, being uniform in appearance and security, and convertible always into coin, would at once protect labor against the evils of a vicious currency, and facilitate commerce by cheap and safe exchanges. (Library of Congress 1862-3, 15)

Note that Lincoln advocates that the notes be convertible "into coin." Given that the United States was off the bimetallic standard when the letter was written, he seems to be advocating the resumption of payments after the Civil War was over, which, as noted above, did occur, but not until 1 January 1879, more than 14 years after the Civil War ended.

In another letter to the House of Representatives on 17 January 1863, President Lincoln states both reasons for establishing the national banking system:

> In order to raise money by way of loans most easily and cheaply, it is clearly necessary to give every possible support to the public credit. To that end a uniform currency, in which taxes, subscriptions to loans, and all other ordinary public dues, as well as private dues may be paid, is almost, if not quite indispensable. Such a currency can be furnished by banking associations, organized under a general act of Congress, as suggested in my message at the beginning of the present session. The securing of this circulation, by the pledge of United States bonds, as therein suggested, would still further facilitate loans by increasing the present and causing a future demand for such bonds. (Library of Congress 1862-3, 207-08)

President Lincoln was not the only one making arguments for the benefits of a uniform currency. Shortly before the passage of the National Currency Act, John Sherman, a Senator from Ohio, made a speech on 10 February 1863 in which he refers to "The losses in various ways from the use of their [state banks'] money, its deterioration in value, the want of security, the want of uniformity" (Sherman 1879, 60). He goes on in the speech to quote the opinion of the *London Times* on the system of state bank notes:

> By the want of a paper currency that would be taken in every State of the Union at its nominal value the Americans have suffered severely. The different States were, as to their bank notes, so many foreign nations, each refusing the paper of the others, except at continually varying rates of discount. Frequently there was a greater loss on paper taken or sent from an Eastern to a Western State than on English bank notes converted into Austrian money in Vienna. Only adepts and regular money-changers could tell whether a note was current or not, the paper of broken or suspended banks remaining in circulation long after their value had departed. (Sherman 1879, 64)

The following remarks in the article "A Uniform National Currency" by a Western banker in *Merchants Magazine and Commercial Review* v. 48 1863, January-June, express a similar conviction:

> The first uprooting of the present system of the issue of bank notes by the different State Legislatures, and the establishment of the national system at Washington, which shall include the uniformity, the safety, and the convertibility of all currency, together with the certainty that hereafter the amount shall not exceed the debt of the general government, will form a new era in the history of the country. The blood which circulates through the whole system of finance will be comparatively pure; the machinery of business now retarded by friction, will buzz as under the influence of the most perfect system of lubrication, and by its increased facilities, a large part of the cost of the present rebellion will be returned to the people during the next half century. (p. 34)

One question that arises at this point is why the uniform currency was to be issued by banks rather than the federal government, especially since greenbacks were already in circulation. The answer can be found once again in the speech by John Sherman in support of the National Banking Act. He both posed the question and gave an answer:

> why not directly issue the notes of the Government, and thus save to the people the interest on the debt represented by the notes in circulation?
>
> The only answer to this question is, that history teaches us that the public faith of a nation alone is not sufficient to maintain a paper currency. There must be a combination between the interests of private individuals and the Government. (Sherman 1879, 64-65)

Earlier in this same speech (p. 63) he also argues that the propensity of banks to overissue currency would also be checked if the combination of interests could be achieved.

As Figure 1 shows, the national banking system did not prove popular with existing or potential banks at its inception. Few national banks were established, either de novo or by conversion of state banks, shortly after the National Banking Act was passed. Only 179 national banks were in operation on 1 January 1864 and only 676 on 1 January 1865.

Figure 1: National banks in operation, 1864-1913.

Source: *Annual Report of the Comptroller of the Currency* (1914 (volume 2), Table 6)

However, this situation changed dramatically after 3 March 1865 when an act was passed with this provision:

> That every national banking association, state bank, or state banking association, shall pay a tax of ten percentum on the amount of notes of any state bank or state banking association, paid out by them after the first day of July, eighteen hundred and sixty-six.

This 10 percent tax on the paying out of state bank notes after 1 July 1866 (later changed to 1 August 1866) was enough to drive state bank notes out of existence and caused many state banks to convert to national banks. On 1 January 1866, 1,614 national banks were in operation. By 1 January 1913 that number had grown to 7,431.[8]

The profitability of note issue to national banks worked as follows. The shareholders of a national bank would take their capital ($100,000 for the sake of illustration) and buy $100,000 worth of government bonds, on which they would earn interest. They would deposit these bonds with the Comptroller and receive 90 percent of that value ($90,000) in national bank notes.[9] They would then lend out the $90,000, and receive interest on the loans. Thus,

[8]Figure 1 shows a rapid increase in the number of national banks beginning in 1900. Three provisions of the 14 March 1900 act that changed the regulations on national banks may have accounted for this. These changes were: (1) the minimum capital for banks in small towns was lowered, (2) the collateral banking for national bank notes was reduced to the amount of circulation, and (3) the tax on circulation was lowered to 1/2 percent per annum on notes backed by 2 percent bonds.

[9]They would receive 100 percent of the value of the bonds deposited after 1900.

by becoming a national bank they could earn interest on $190,000 worth of assets with their $100,000, rather than on only $100,000 of assets if they had not established a national bank. Of course, this example only illustrates the basic idea behind the profitability of note issue. It ignores the fact that a national bank would not have been able to lend the full $90,000, since it would have to hold some as non-interest bearing specie or greenbacks to redeem notes when presented. It also ignores the fact that national banks were taxed one percent per year on the amount of notes they had in circulation.

5 Similarities between National Bank Notes and E-money

In this section, I discuss the similarities between national bank notes and e-money that make studying the experience with national bank notes useful for learning about how a privately-issued currency system could work. These similarities are that national bank notes had monetary value, were a liability of the issuer, and were widely accepted as media of exchange.

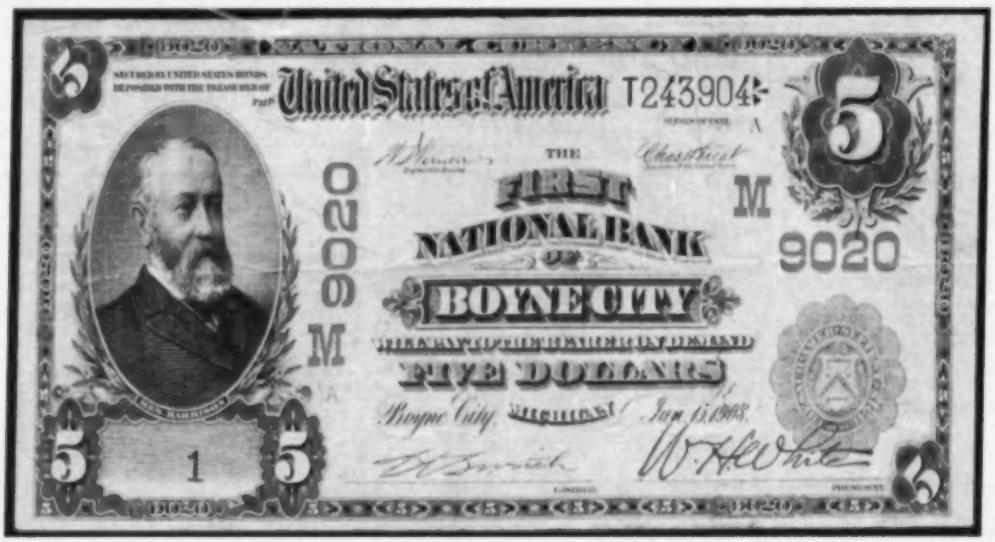

Figure 2: A representative national bank note

That national bank notes had monetary value is illustrated by the national bank note shown in Figure 2. National bank notes were denominated in U.S. dollars. The National Banking Act permitted them to be issued in denominations of $1, $2, $3, $5, $10, $20, $50, $100, $500, and $1,000. However, the Act also specified that no more than 1/6 of the notes issued could have a denomination of less than $5.[10]

That national bank notes were a liability of the issuer is also illustrated by the note in Figure 2. Notes were clearly distinguishable by issuer and contained the statement that they were redeemable on demand, payable to the bearer. The National Banking Act had the

[10]To put these denominations in some perspective, $5 in 1864 is equivalent to approximately $75 today and $5 in 1914 is equivalent to approximately $120 today.

provision that redemption of notes had to be "in the lawful money of the United States" (Sec. 46). It did not state that they had to be redeemed in legal tender. Lawful money during the period under consideration was coin, demand notes, and greenbacks.[11]

To help national bank notes become widely accepted as media of exchange, Section 23 of the National Banking Act contained the provision that national bank notes

> shall be received at par in all parts of the United States in payment of taxes, excises, public lands, and all other dues to the United States, except for duties on imports; and also for all salaries and other debts and demands owing by the United States to individuals, corporations, and associations within the United States, except interest on the public debt, and in redemption of the national currency [United States Notes].

Some evidence that national bank notes were widely accepted as media of exchange is given in Table 1, which shows the total amount of national bank notes issued and redeemed as of 31 October 1913. By far, the majority of the notes were redeemed, which means taken out of circulation, because they were worn or mutilated. Since notes would become worn or mutilated through usage, the high percentage of redemptions is evidence that national bank notes were widely used in transactions. Some further evidence on this point is given in the *Annual Report of the Comptroller of the Currency* (1873, XLVII):

> The amount of legal-tender notes and the amount of national bank notes in circulation are about equal. The whole issue of the national bank notes is, however, continually in circulation, while more than one-third of the legal-tender notes is held permanently by the national banks as reserve.... If the national banks are not in as good condition as the legal-tender notes, the reason is evident.

The only issue about whether national bank notes satisfy my definition of e-money is the part about being issued in receipt of funds, which implies that e-money is prepaid and thus is not issued on credit. This was most certainly not the case with regard to the issuance of national bank notes. In general, they were not issued in exchange for greenbacks or specie. Instead, they were issued when the issuing bank discounted promissory notes or bills presented by the customer. In other words, they were issued as a part of normal bank lending operations, in much the same way as deposits are issued when customers obtain loans from modern-day banks. However, I do not believe that this difference between national bank notes and e-money lessens the usefulness of the experience with national bank notes for learning about privately-issued currency systems.

[11] Because the National Banking Act stated that national bank notes were to be redeemed in lawful money, I will use that term, rather than the term legal tender throughout the paper. It is interesting to note that the demand notes were not made lawful money in the original act authorizing their issuance. The designation as lawful money was done by an act of 17 March 1862. For a discussion of the distinction between lawful money and legal tender, see "What is lawful money? How is it different from legal tender?" in the FAQs on the website of the Federal Reserve System.

Denomination	Issued	Redeemed	Outstanding	% Redeemed
ones	23,169,677	22,826,090	343,587	98.52
twos	15,495,038	15,330,726	164,312	98.94
fives	1,695,254,560	1,549,262,050	145,992,510	91.39
tens	2,538,961,960	2,208,178,850	330,783,110	86.97
twenties	1,520,196,340	1,290,247,360	229,948,980	84.87
fifties	211,971,750	192,357,200	19,614,550	90.75
one hundreds	360,778,050	327,410,700	33,367,350	90.75
five hundreds	11,947,000	11,860,000	87,000	99.27
one thousands	7,379,000	7,356,000	23,000	99.69
Total	6,385,153,375	5,624,828,976	760,324,399	88.09

Table 1: National Bank Notes Issued and Redeemed by Denomination as of 31 October 1913. Source: *Annual Report of the Comptroller of the Currency*, 1913, Table 17, 120

6 Ease of Transacting and Counterfeiting of National Bank Notes

In Weber (2014), I discussed two efficiency problems with state bank notes: a lack of ease in transacting and widespread counterfeiting. In this section, I consider the extent to which these problems were addressed for national bank notes.

The lack of ease in transacting with state bank notes was caused by two restrictions: they were issued in a limited number of denominations, and the quantity of notes issued in small denominations was usually limited. National bank notes were subject to the same restrictions. The majority of the notes in circulation were of only three denominations: $5, $10, and $20. On 1 November 1874, these three denominations made up 82 percent of the value of national bank notes outstanding (the percentages were 37, 27, and 17, respectively), and $1 and $2 denominations made up only 2.5 percent of the value of national bank notes outstanding. On 31 October 1913, $5, $10, and $20 denominations made up 93 percent of the total value of bank notes outstanding (the percentages were 19, 44, 30). Further, there was the restriction that denominations of less than $5 could not be issued after resumption, which occurred on 1 January 1879. As a result, $1 and $2 denominations almost disappeared. They were less than 0.1 percent of the value of national bank notes outstanding on 31 October 1913. This concentration of bank notes issued in these three denominations was also typical of the issues of state banks in the period prior to the National Banking Act. Thus, the lack of ease in transacting with state bank notes was not addressed with national bank notes.

The National Banking Act did address the problem of widespread counterfeiting of bank notes, however. It contained the provision that "the comptroller of the currency is hereby authorized and required ... to cause plates and dies to be engraved, in the best manner to guard against counterfeiting and fraudulent alterations" (Sec. 22). It also specified that persons convicted of counterfeiting "be imprisoned and kept at hard labor for a period of not less than five years, nor more than fifteen years, and fined in a sum not exceeding one thousand dollars"(Sec. 59), a harsh punishment.

There was another feature of national bank notes that some have argued would have

made counterfeiting less widespread. This feature, which can be seen by comparing the note in Figure 2 with the note in Figure 3, was that the basic design of the notes of a given denomination was similar except for the name of the bank. This reduction in the varieties of notes, it was argued, made counterfeiting more difficult because it made the detection of counterfeits easier:

> The bank teller detects the worst alterations from association, and if the chief engraving of a note is well remembered he will not be deceived. ... if they [the vignettes and engravings] are *always* uniform in bills of the same denomination, the poorest judge of money cannot be deceived with regard to their value. ("A Uniform National Currency," *Merchants Magazine and Commercial Review* v. 48 1863, January-June, p. 34)

Figure 3: Another representative national bank note

However, there is the counterargument that similarity of design created economies of scale for potential counterfeiters.

It appears that counterfeiting was not a huge problem with national bank notes. The *Annual Report of the Comptroller of the Currency* for 1873 has an "extract from a letter of a well-known Boston cashier, who has had great experience as secretary of the association of banks for the supression of counterfeiting." This extract states:

> There has been no counterfeit on any of the notes of this bank to my knowledge; and the amount of counterfeit notes of other banks presented to this bank for redemption or examination, say for the past year, has been very small. I should not estimate it at more than $250. (United States. Office of the Comptroller of the Currency, 1873, XLVIII)

7 Limits on the Supply of National Bank Notes

Overissuance did not seem to be a problem with state bank notes, and it was not a problem with national bank notes. Initially, the amount of national bank notes that could be issued was limited to $300 million in the National Banking Act. This limit was raised to $354 million by the act of 12 July 1870. This initial limit on the quantity of national bank notes appears to have been motivated by the fear of inflation if there are no limits to the issue of inconvertible paper currency. This fear was well stated by President Lincoln once again in his letter to the House of Representatives of 17 January 1863:

> While giving this approval [to the issue of an additional $100,000 of United States notes], however, I think it my duty to express my sincere regret that it has been found necessary to authorize so large an additional issue of United States notes, when this circulation and that of the suspended banks together have become already so redundant as to increase prices beyond real values, thereby augmenting the cost of living to the injury of labor, and the cost of supplies to the injury of the whole country.
>
> It seems very plain that continued issues of United States notes, without any check to the issues of suspended banks, and without adequate provision for the raising of money by loans, and for funding the issues so as to keep them within due limits, must soon produce disastrous consequences. And this matter appears to me so important that I feel bound to avail myself of this occasion to ask the special attention of Congress to it. (Library of Congress 1862-3, 207-08)

The limit was entirely removed by the act of 14 January 1875, the same act that provided for the resumption of specie payments on United States notes. It seems likely that once the mechanism for resumption was in place, there were no longer concerns about limiting the supply of national bank notes, because it would automatically be limited by the quantity of gold and silver available as reserves needed to redeem them. What is interesting, however, is that once specie payments were resumed, national banks were restricted to issuing notes of $5 or larger. That is, once the gold standard limit on the issuance of national bank notes was put in place, a denomination restriction intended to prevent overissuance and inflation was tightened.

The lack of concern about a relationship between the quantity of national bank notes and inflation is confirmed in the data. National bank note circulation and consumer prices for the period 1874 to 1913 are plotted in Figure 4. It shows that the correlation between circulation and prices was not strong, only 0.17. Further, the turning points of the two series were different. National bank note circulation began increasing after 1891; the increase in prices did not happen until nine years later. The magnitudes of the changes in the two series were different as well. The circulation of national bank notes in 1913 was almost four and a half times larger than it was in 1892. Over the same period, prices increased only by approximately 8 percent.

The lack of a relationship between national bank note circulation and changes in prices is not surprising. As Figure 5 shows, there was strong growth in real GDP from 1874 to 1913. Real GDP was four-and-a-half times larger in 1913 than it was in 1874. And at least after

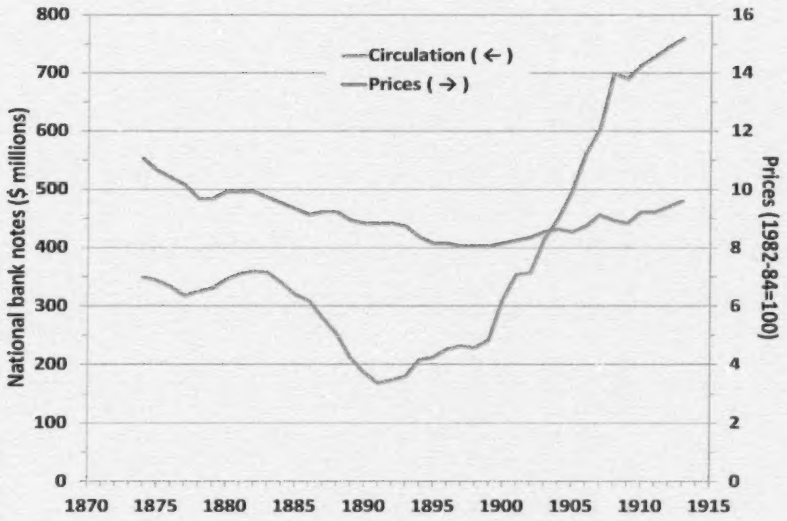

Figure 4: National bank notes in circulation and consumer prices, 1874-1913.

Sources: *Annual Report of the Comptroller of the Currency* (1914, Table 22) and Officer and Williamson (2014)

1890, the strong growth in real GDP coincided with strong growth in the quantity of national bank notes. Following the quantity theory, the strong growth in real GDP meant that the economy could absorb the growth in national bank note circulation without inflation.[12]

8 Safety and the Federal Insurance of National Bank Notes

There were numerous cases in which the holders of state bank notes suffered losses. This lack of safety was seen as one of the major efficiency problems with state bank notes, as shown by the remarks quoted in section 4 above.

Just as there were failures of state banks, there were failures of national banks. As of 1 January 1914, 10,472 national banks had been organized. Of these, 513 failed.[13] The number of national bank failures by year is shown in Figure 6.[14] The figure shows that in most years

[12]Figure 4 shows that prices were declining from 1874 until 1890, and a look at the data further back shows that the price decline began in 1865. Figure 5 shows that real GDP was increasing over this period, and a look at the data further back shows that real GDP grew every year from 1865 to 1890 except for a slight decline in 1874. Thus, the 25-year period 1865 to 1890 is a counterexample to those who argue that inflation is necessary for an economy to grow.

[13]There were also 2,450 banks in voluntary liquidation. Data are taken from *Annual Report of the Comptroller of the Currency* (1914, Table 6, 13). The total number of banks in operation on 1 January 1914 was 7,509.

[14]The number of failures for a year is computed as the number of banks that failed between 1 November of the previous year to 31 October of the current year. This is how the data are reported by the Comptroller.

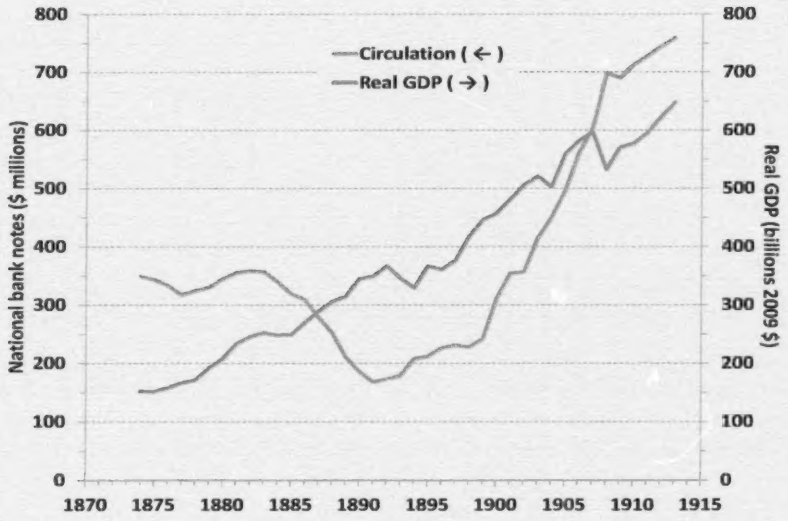

Figure 5: National bank notes in circulation and real GDP, 1874-1913.

Sources: *Annual Report of the Comptroller of the Currency* (1914, Table 22) and Williamson (2014)

the number of failures was small: there were 10 or fewer failures in approximately two-thirds of the 50 years from 1864 to 1913. The largest number of failures in any year was 65 failures in 1893, which was the year in which there was a major financial crisis in the United States.

Further evidence that the number of national bank failures was small is given in Figure 7, which plots the number of failures in a year as a percentage of the number of banks in existence at the beginning of the year. In over 80 percent of the years, the failure rate is less than 1/2 percent. The highest percentage of failures is 1.7 percent, which also occurred in 1893.

More perspective on the magnitude of national bank failures is gained by comparing the failure rate of national banks with that of state banks before 1861. A comparison of the failure rates in Figure 7 with those in Figure 6 in Weber (2014) shows that, for most years, the failure rates for both national banks and state banks were of about the same order of magnitude. The comparison also shows that, for both categories of banks, failures tended to spike during periods of financial distress. However, the percentage of national bank failures was never as large as that experienced by state banks during the periods 1818 to 1821 and 1838 to 1842, when failure rates for state banks exceeded 4 percent in some years.

The National Banking Act addressed the problem of note safety by providing federal insurance in the sense that the U.S. Treasury would redeem a failed national bank's notes regardless of whether the assets of the bank were sufficient to cover its note liabilities. Such insurance was necessary for note safety because the Treasury bond collateral requirement was not sufficient. Bond prices could fall below par, so that the bond collateral would not

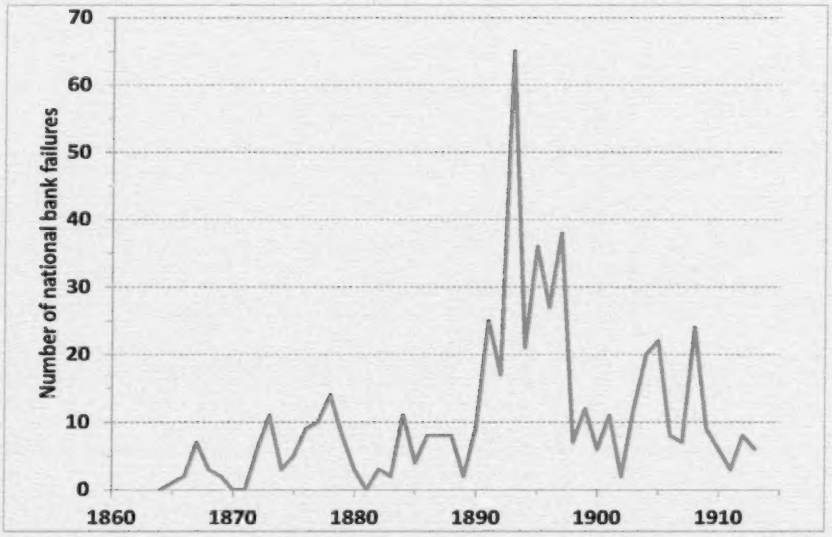

Figure 6: National bank failures by year, 1865-1913.

Source: *Annual Report of the Comptroller of the Currency* (1914, Table 34)

be sufficient to redeem a bank's notes. This happened often with the state bonds held as backing by free banks in the earlier period when state banks were issuing notes (see Weber 2014). It also happened with U.S. government bonds. The 4s of 1907 fell below par in late 1878 and early 1879, and the 2s of 1930 fell below par in June 1913.[15]

Although federal insurance was not explicitly contained in the National Banking Act, it was implicit given the process for the redemption of the notes of failed national banks, which was as follows:

> Immediately upon declaring the bonds of an association [national bank] forfeited for non-payment of its notes, the Comptroller shall give notice ... to the holders of the circulating notes of such association, to present them for payment at the Treasury of the United States; and the same shall be paid as presented in lawful money of the United States. (Section 5229 of the Revised Statutes)

What is important about this redemption provision is not what is contained in it, but what is not. There is no mention that notes would not be paid by the Treasury if the assets of the failed bank were insufficient to pay off all notes, or that redemption of notes would only take place after the value of the failing bank's assets had been ascertained. The Treasury

[15] During this period, bond issues were denoted by their coupon and maturity date. For example, the 4s of 1907 were 4 percent coupon bonds paying semi-annual interest that matured in 1907.

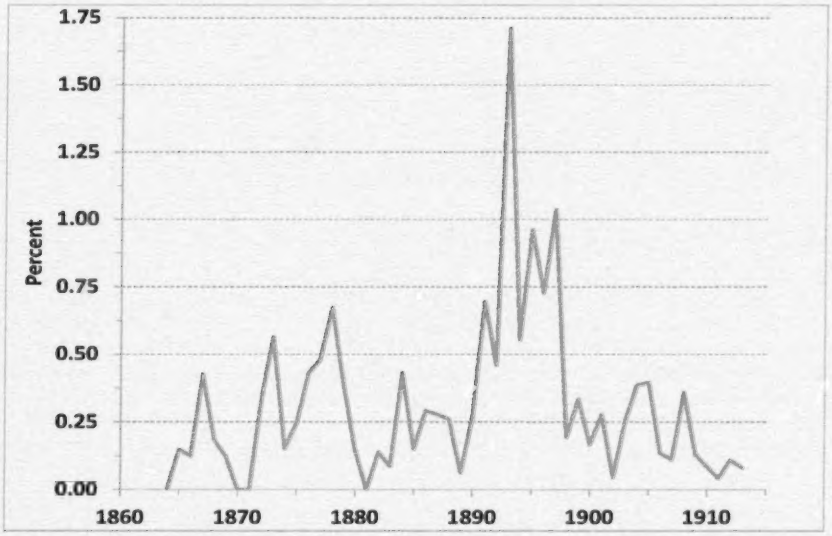

Figure 7: National bank failures as a percentage of banks in existence by year, 1865-1913.

Source: *Annual Report of the Comptroller of the Currency* (1914, Tables 6 and 34)

would pay off notes in lawful money and worry about how it would get reimbursed later. Further evidence that national bank notes were fully insured by the federal government is the statement in the *Annual Report of the Comptroller of the Currency* that "the United States guarantees the final payment of the notes" (1874, XI). The Comptroller of the Currency (U.S. Treasury) covered its losses on providing this insurance in several ways. The first is that national banks were required to post collateral with the Comptroller in the form of U.S. government bonds with an initial value greater than that of the notes that were being insured. As stated in the Act, the note issue of any national bank could not be greater than 90 per cent of the maximum of the market or par value of the bonds that it had deposited with the United States Treasurer:[16,17]

> That upon the transfer and delivery of [United States government bonds] to the treasurer [of the United States] ... the association [national bank] making the same shall be entitled to receive from the comptroller of the currency circulating notes of different denominations ... equal in amount to ninety per centum of the current market value of the United States bonds so transferred and delivered, but

[16]This provision was changed in the Act of 14 March 1900 to permit notes to be issued for up to 100 per cent of the bonds deposited with the treasurer.

[17]This collateral requirement on note issue was similar to that imposed on the note issue of state banks formed under free banking laws. The difference was that free banks could deposit state bonds as collateral, whereas national banks were restricted to depositing U.S. government bonds.

> not exceeding ninety per centum of the amount of said bonds at the par value thereof, if bearing interest at a rate not less than five per centum per annum; and at no time shall the total amount of such notes, issued to any such association, exceed the amount at such time actually paid in of its capital stock. (Sec. 21)

The U.S. Treasurer was authorized under the National Banking Act to "cancel an amount of bonds pledged by such association [the national bank whose notes are being redeemed by the Treasury] equal at current market rates, not exceeding par, to the notes paid" (Section 47), where "to cancel" the pledged bonds meant that they would no longer belong to the failed bank, but would belong to the Treasury. The Act (Section 49) also provided that "the comptroller of the currency may ... sell at private sale any of the bonds pledged by such association, and receive therefor either money or the circulating notes of such failing association."

It might seem that this collateral requirement would entirely protect the Comptroller against any losses, especially since bonds were canceled at the minimum of market or par and bonds were selling above par for most of this period. Nonetheless, the National Banking Act recognized that the market value of U.S. government bonds could fluctuate and contained three additional provisions to protect the insurance fund against losses.

One of these provisions was a call provision. Section 26 of the Act authorized the Comptroller of the Currency to demand an additional deposit of bonds if the market value of the bonds deposited as collateral fell below the amount required to back a bank's circulation.

The second additional provision was that the U.S. Treasury had first lien on the assets of a failed national bank if the sale of its government bonds were insufficient to cover the redemption of its notes:

> For any deficiency in the proceeds of all the bonds of an association, when thus sold, to reimburse to the United States the amount expended in paying the circulating notes of the association, the United States shall have a paramount lien upon all its assets; and such deficiency shall be made good out of such assets in preference to any and all other claims whatsoever, except the necessary costs and expenses of administering the same. (Section 5230 of the Revised Statutes)

The third additional provision was that the note issue of a national bank could not exceed its paid-in capital. This provision meant that the capital stock of the bank was also available to pay off note holders, since national bank stockholders were subject to double liability.[18] The Comptroller of the Currency made use of this provision. The Comptroller's reports contain a table "Insolvent national banks, dates of organization, ... and additional assets, amounts collected." One of the columns of this table is a bank-by-failed-bank listing of the amounts "Collected from assessment upon share-holders." These amounts are non-zero for well over half of the bank failures.

Given that the U.S. Treasury was ultimately on the hook for the redemption of national bank notes, it also is not surprising that there were provisions in the National Banking Act for the supervision of national banks. There were four such provisions in the Act:

[18]The exact provision in the Act was "The shareholders of each association ... shall be held individually responsible, equally and ratably ... for all contracts, debts, and engagements of such association to the extent of the amount of their stock therein ... in addition to the amount invested in such shares."(Sec. 12)

1. "Once or oftener in each fiscal year" the Comptroller of the Currency was to compare the bonds deposited with it with the bank's accounts of such deposits. (Sec. 25)

2. Each bank had to make to the Comptroller of the Currency a quarterly "report [that] shall exhibit in detail ... the resources and liabilities of the association." Abstracts of the reports were to be published in a Washington newspaper and a newspaper in the bank's location. (Sec. 34)

3. Each bank had to make to the Comptroller of the Currency a monthly report of condition showing the "average amount of loans and discounts, specie, and other lawful money belonging to the association, deposits, and circulation." (Sec. 34)

4. Every national bank was to be examined "as often as shall be deemed necessary or proper." Examiners were to "make a thorough examination into all the affairs of the association" and to "examine any of the officers and agents thereof on oath." They were also to "make a full and detailed report of the condition of the association to the comptroller." (Sec. 54)

Given the provisions for the U.S. Treasury to obtain resources from the sale of bonds, its first lien on the assets of the failed bank, double liability of shareholders, and supervision, it is not surprising that the insurance fund (the U.S. Treasury) did not suffer any losses from its insurance of national bank notes. It should be noted, however, that there were cases in which it enforced double liability and went after shareholders for additional funds.

9 Making National Bank Notes a Uniform Currency

In Weber (2014), I presented evidence that a major efficiency problem with state bank notes was that they did not exchange at par with each other and that the discounts on them depended on the location of the issuer and where an exchange was to take place. The discounts also fluctuated over time. This lack of par exchange was seen by contemporaries as a problem, which, as the remarks quoted in section 4 show, was put forth as the complaint that state bank notes did not provide a "uniform currency."

Although the exact meaning of the term uniform currency is not clear from the quotations, for the purposes of this paper, I define it as follows: Multiple media of exchange issued by different issuers are a uniform currency if

1. they are expressed in the same monetary unit,

2. they trade at par (at their face value) in all transactions that involve the non-issuer public, and [19]

3. prices are stated in terms of the monetary unit only.

[19] I refer to the relevant population as the "non-issuer public" rather than the non-bank public because the issuers of e-money may not be banks. I use the term "trade at par" instead of "fixed exchange rate" since the latter term is usually applied to media of exchange expressed in different monetary units and implicitly assumes the existence of a government entity (or entities) that stands willing to always make exchanges at the fixed rate.

There are four points to note about this definition:

1. It requires the media of exchange to be expressed in terms of the same monetary unit. Thus, by this definition a set of media of exchange could not be a uniform currency if, for example, some were expressed in dollars and others in pesos.

2. Both privately-issued and governmentally-issued media of exchange are included. Thus, different privately-issued media of exchange trade at par with each other, not just with whatever is considered lawful money. Consequently, for national bank notes to have been a uniform currency, they would have had to trade at face value against each other and against lawful money.

3. The set of agents for whom the media of exchange must trade at par is specified as the non-issuer public, not as all agents.

4. Different prices are not quoted for different media of exchange; that is, there would not be such things as "discounts for cash."

Media of exchange can be different either because they are of different "kinds" of media of exchange or of different "denominations" of the same "kind" of medium of exchange. By different "kinds" of media of exchange, I mean to distinguish between, for example, coins of different medals, paper currencies of different issuers, deposits in different banks, and so forth. By different "denominations," I mean to distinguish different numbers (denominations) on the same kind of medium of exchange.

When there are multiple media of exchange, some type of mechanism is generally required for them to be a uniform currency.[20] Some examples of such mechanisms are:

- different amounts of metal in coins;

- different amounts of metal promised for redemption of governmentally-issued paper currency depending on denomination;

- a monetary authority willing to exchange different kinds of media exchange or different denominations of one kind of medium of exchange at a fixed rate at no cost to the holder.

The general conclusion of researchers of the period under study here is that, at least after 1874, national bank notes were a uniform currency: notes of different national banks exchanged at par with each other and with lawful money. For example, Friedman and Schwartz (1963, 21-22) state, "national bank notes after that date circulated at parity with other currency ...."

The mechanism in the National Banking Act that led to national bank notes being a uniform currency had five parts, which I describe in the remainder of this section. The first three parts of the mechanism would make the general public indifferent in choosing between the notes of individual national banks and indifferent between national bank notes

[20]For a discussion of the indeterminacy of equilibrium exchange rates in the absence of a mechanism, see Kareken and Wallace (1981).

and lawful money if national banks themselves were indifferent between the notes of other national banks and lawful money. Such indifference between notes of other national banks and lawful money on the part of banks is critical, because without it banks would very likely have treated the notes of other banks as distinct from each other, from their own notes, and from lawful money when non-issuers were making deposits. And if banks differentiated between notes of individual national banks and lawful money, it is likely that this would have caused discounts or premia on the notes of different banks and on lawful money for the non-issuer public – discounts or premia that could have varied over time and location. The result would have been that national bank notes would not have been a uniform currency. The fourth and fifth parts of the mechanism made banks indifferent between notes of other national banks and lawful money.

9.1 Redeemability on demand at par

The first part of the mechanism that led to national bank notes being a uniform currency is they were redeemable in lawful money on demand at the issuing bank at their face value. If the issuing bank could have had the option of not redeeming its notes, or could have arbitrarily specified the amount of lawful money that it would have paid out when a note was presented for redemption, then it is obvious that national bank notes would not have necessarily exchanged at par with each other or with lawful money. This is not to say that national bank notes would not have been valued without this provision. They might well have been. Bitcoin is an example of a non-redeemable privately-issued medium of exchange that is valued. However, my argument is that it is unlikely that national bank notes would have been a uniform currency if they had not been redeemable on demand in lawful money.

Redeemability on demand at par was only one necessary part of the mechanism that made national bank notes a uniform currency. It was not sufficient on its own. The notes issued by different state banks in the United States prior to the Civil War were redeemable on demand in specie. Yet, as described in Weber (2014), the notes of various state banks traded at discounts that varied by location of the bank, the location at which the discount was quoted, and over time.

Taking a note back to the issuing bank for redemption in lawful money could involve transportation, insurance, and time costs. If these costs had to be borne by the note holder, they could depend on the location or condition of the issuing bank and could vary over time. Further, if redemption on demand were not required, an agent might have to wait to convert notes of one national bank to notes of another or to lawful money. The result of these two possible frictions would be that the non-issuer public would not necessarily be indifferent between the notes of individual national banks and between bank notes and lawful money. Such lack of indifference could have led to bank notes not exchanging at par with each other or with lawful money, as was the case with the notes of state banks.

9.2 Par acceptance

Section 32 of the National Banking Act required that every national bank "shall take and receive *at par*, [italics added] for any debt or liability to said association [national bank] any and all notes or bills issued by any association existing under and by virtue of this act." This

par acceptance provision in the National Banking Act is the second part of the mechanism that led to national bank notes being a uniform currency.

This provision had the effect of making the non-issuer public more likely to be indifferent in choosing between the notes of individual national banks. Without this provision, national banks could have refused to accept the notes of other national banks for payments, or to discount them if accepted. The result could have been that an individual with a loan from national bank A would have preferred the notes of national bank A to those of other national banks because national bank A notes could have been used to pay off the loan, whereas the notes of another national bank might not have been.

However, par acceptance also was only one necessary part of the mechanism that made national bank notes a uniform currency. It was not sufficient on its own, for several reasons. One reason is that this provision did not make it any less costly to redeem the notes of a national bank. A member of the non-issuer public wishing to redeem national bank notes for lawful money still had to go to the issuing bank. Thus, it did not lead to the non-issuer public being indifferent between the notes of individual national banks and lawful money.

A second reason is that it only applied to "debts and liabilities." It did not apply to deposits. A national bank did not have to accept the notes of other national banks for deposits at par or at all. A person could use the notes of national bank A to obtain a deposit at national bank A, but might not have been able to use the notes of another national bank, or might have had to accept a discount on those notes, to obtain a deposit at national bank A. Thus, notes of national banks might not have been equally useful in all transactions for the non-issuer public and might not have gone at par in all transactions as a result.

Although the available evidence is that national banks generally accepted the notes of other banks for deposits, this was not always the case. Friedman and Schwartz (1963, 22f) describe an episode when national banks did not accept other national banks' notes for deposit:

> James Buell, president of a New York City national bank, testified in Feb. 1874 that the city banks refused to receive national bank notes for deposit when they became "redundant."

National banks were not necessarily indifferent between notes of other national banks and lawful money. National bank notes could not be used as reserves against deposits. Reserves had to be lawful money or, if the national bank was a country or reserve city bank, deposits at its correspondent national bank in a reserve city or central reserve city.[21] If a national bank took the notes of another bank for deposit, then it would have had to put up reserves against that deposit, but it could not use the notes it acquired as those reserves.

If a national bank took another national bank's notes for deposit, then there were two ways it could get the reserves that would be required to back the deposit. One possibility would be to pay out the bank's notes over the counter (which was not prohibited in the National Banking Act) to obtain lawful money. Another would be to deposit the notes at its correspondent bank, assuming it would accept them. If either of these options were available, then a national bank would be indifferent between the notes of other national banks and

[21] See the Appendix for a discussion of the classification of national banks and how the reserve requirements on deposits could be fulfilled by deposits at other national banks.

lawful money. However, James Buell's remark above seems to indicate that this was not always the case, which is how I interpret the term "redundant."

Of course, there was good reason for not requiring a national bank to accept the notes of other national banks for deposits at par or at all. Requiring a national bank to accept the notes of other national banks for deposits would have required a national bank to redeem the notes of other banks. A person could deposit the notes of another bank and then immediately turn around and demand lawful money for that deposit. The bank issuing the deposit would essentially be redeeming the notes of another bank. This would create a huge incentive for banks to overissue notes, since the probability that they would be required to redeem their own notes would be lower.

9.3 Federal insurance

Even though redemption on demand and par acceptance worked toward making the non-issuer public indifferent between national bank notes and lawful money, they were not enough to make national bank notes a uniform currency. There was still the possibility that a national bank could fail and that there could be losses to note holders, or that there would be a suspension of payments on national bank notes. Either of these possibilities could have caused the notes of that bank to trade at a discount. The experience with the notes of state banks described in Weber (2014) shows that this could be the case. Notes of state banks that had failed or were suspected to be in danger of failing traded at much larger discounts than those of similar banks that were seen as strong and continuing to redeem their notes. These discounts reflected the losses that holders of notes of failing or failed banks could expect to suffer. And notes of state banks went at a discount against specie when there was a suspension of payments. For example, in December 1857, when Philadelphia banks suspended payments on their notes, specie ("American gold") was quoted at a 1-1/2 to 2-1/2 percent premium (*Van Court's Counterfeit Detector and Bank Note List*, 4).

National bank notes were federally insured against losses due to failure of the issuing bank. Federal insurance of national bank notes meant that holders would never experience losses if the issuing bank failed, since they could take their notes to the U.S. Treasury and receive lawful money regardless of the value of the asset portfolio of the issuing bank. The effect was to remove this reason for the non-issuer public to not be indifferent to the notes of individual national banks and lawful money.[22]

Again, however, federal insurance is only one necessary part of the mechanism. It is not sufficient for the same reason that par acceptance was only necessary and not sufficient: national bank notes could not be used as reserves against deposits.[23]

[22]I have not included in the mechanism the government bond requirement behind national bank note issuance for two reasons. First, U.S. government bonds could (and did) fluctuate in price, so that the value of the collateral could fall below the face value of banks' note issuance. Hence, the collateral requirement did not rule out national bank failures, just as the bond collateral requirement did not prevent failures of state banks. Second, as discussed in section 8, I view the collateral requirement as a way of providing insurance for repayment to the insuring agency, the U.S. Treasury, rather than as insuring payment of note holders.

[23]It might seem that the lack of interbank par acceptance of checks in the United States until the Federal Reserve took action in the 1950s is also evidence that insurance against losses due to the failure of the issuing bank is neither necessary nor sufficient for a medium of exchange to be a uniform currency. The lack of par acceptance occurred even though deposits were insured by the Federal Deposit Insurance Corporation

9.4 Gross clearing facility

The previous three parts of the mechanism went a long way toward making the non-issuer public indifferent between the notes of individual national banks and between national bank notes and lawful money. But they were not sufficient to make national bank notes a uniform currency, since they did not do the same for banks. Without the next two parts of the mechanism, banks would not necessarily have been indifferent between national bank notes and lawful money, because national bank notes could not count as reserves against deposits. Therefore, banks might have refused or discounted the notes of other national banks in certain transactions.

Given that a national bank was required to accept the notes of other banks at par in the payment of debts and liabilities, more likely than not it would have received notes of other national banks in the normal course of business. The original National Banking Act permitted a national bank to pay out these notes, but it contained no provision for national banks to clear notes of other national banks in the sense of being able to easily exchange them for lawful money. The only way a national bank could be certain of obtaining lawful money for the notes of another national bank in a timely manner was to bear the expense of taking each note it received to the bank issuing the note.

This situation changed on 20 June 1874 with the passage of "An act fixing the amount of United States notes, providing for a redistribution of the national bank currency, and for other purposes." This act contained the following provisions:

- Each bank had to deposit lawful money equal to 5 percent of its circulation with the U.S. Treasury. However, this amount would count as part of the reserves that national banks had to hold against deposits.

- Banks could present to the U.S. Treasury notes of other national banks, "assorted or unassorted," in multiples of $1,000 for *redemption in United States Notes.*

- When the amount of redemptions of a bank's notes reached $500, the U.S. Treasury would require that bank to deposit United States Notes equal to the amount of its notes redeemed. The bank's notes that were not "worn, defaced, or mutilated" would be returned to the issuing bank; the others would be destroyed.

This gross clearing facility for national bank notes located at and run by the U.S. Treasury, set up by the 20 June 1874 act, is the fourth part of the mechanism. The official name of this gross clearing facility was the "National Bank Redemption Agency." National banks were required to join by depositing 5 percent of their circulation in United States Notes with the U.S. Treasury. However, there was no cost to the bank of having to maintain this redemption account, since the amount deposited at the clearing facility counted as part of the reserves that national banks had to hold against deposits. After making the deposit,

(FDIC). The difficulty is that checks are a liability of the payor, not a liability of the bank. The bank's obligation is to pay lawful money to the depositor on demand, and this is what the insurance covers. The bank does not have a liability to pay the payee of a check if the funds are not in the payor's account. Also, FDIC does not insure that a check will be paid, hence the prevalence of restrictions on what checks will be accepted ("no out of town checks accepted") or whether checks will even be accepted.

they could receive shipments of United States Notes from the Treasury by sending in notes of other national banks, but would be required to top up their deposit at the agency as their notes were presented for redemption.[24]

Thus, prior to the establishment of the federal clearing facility, if a national bank took in notes of another bank and it wanted to obtain lawful money for them, it had two options: (i) it could hold the notes until it could pay them out over its counter and forgo the interest it could earn on other assets while doing so, or, (ii) if a bank did not think it could pay them out over its counter in a timely manner, then it could send them to the issuing bank for redemption in lawful money and bear the costs of doing so. The par acceptance requirement meant that banks could only pass along these costs to note holders in very restrictive ways. But the statement quoted above from the New York City national bank president shows that there were instances when they did prior to 1874. And this meant that national bank notes would not have always exchanged at par with lawful money or necessarily with each other prior to that time.

After the establishment of the gross clearing facility, a national bank could take all of the national bank notes it received regardless of issuer to the U.S. Treasury and receive lawful money for them. Nonetheless, it still had to bear the cost of getting the notes to the U.S. Treasury. It might seem that this might lead banks to not be indifferent between the notes of other banks and lawful money and, using the same arguments as those given above, lead to national banks not being a uniform currency.

However, very few national bank notes were sent to the U.S. Treasury in Washington, D.C. Instead, the vast majority of notes were sent to a subtreasury.[25] There were nine subtreasuries, located in the central reserve cities of New York, Chicago, St. Louis and the reserve cities of Baltimore, Boston, Cincinnati, New Orleans, Philadelphia, and San Francisco. The vast majority of notes came to the National Bank Redemption Agency from banks in eight of these cities.[26] For example, in 1907 slightly over 83 percent of the notes presented to the National Bank Redemption Agency came from banks in these eight cities.

Based on this evidence, I postulate that events proceeded as follows when a national bank took in the notes of another national bank. If the bank could pay out the note over its counter for lawful money, it would do so. If not, it would send the note to the reserve bank or central reserve city national bank with which it had an account. The reserve city or central reserve city bank would then bundle all the notes it received from its respondent banks and take them to a subtreasury for redemption in lawful money.

[24] At the time that the facility was established, it was stated that, "The exchange of national bank notes for new notes at the Treasury is ... chiefly desireable on account of the mutilated condition.... The chief object of the law was the purification of the circulation." (*Annual Report of the Comptroller of the Currency*, 1874, XII)

[25] According to Cagan and Schwartz (1991), relying on testimony of Secretary of the Treasury Carlisle in 1894, national bank notes were redeemed at subtreasuries even though the law stated that they were only redeemable at the Treasury in Washington, D.C.

[26] San Francisco is the exception.

9.5 Clearing costs borne by issuer

Setting up a mechanism so that different media of exchange trade at a desired, fixed rate is costly.[27] That definitely was the case for setting up the four parts of the mechanism – redemption on demand, par acceptance, federal insurance, and gross clearing – that enabled national bank notes to be a uniform currency that were just discussed.

Of course, once there are costs, the question is, Who bears them (incidence)? The fifth and final part of the mechanism that led to national bank notes being a uniform currency is that the costs of the mechanism were borne by the issuers of national bank notes rather than by the users of the notes, where by users I mean the non-issuer public and national banks receiving the notes of other national banks.

The costs of redemption on demand and par acceptance of national bank notes were clearly borne by the national bank issuing the note, and not by the user of it. The cost of the federal insurance also was not borne by the users of national bank notes, since redemption on demand prohibited banks from discounting notes when they issued them. Whether the costs of insurance were borne by banks because they were taxed on the amount of their circulation or were borne by the general public does not matter for my argument.

The cost of clearing national bank notes at the National Bank Redemption Agency also was borne by the issuing bank. According to the act establishing that agency, national banks had to reimburse the U.S. Treasury for the costs of "transportation, and the costs for assorting such notes [the notes they issued that were redeemed] ...in proportion to the circulation redeemed." Thus, the more a bank's notes were presented to the National Bank Redemption Agency for redemption, the greater the cost to it. It did not matter to a national bank how many notes of other national banks it sent to the National Bank Redemption Agency, only how many of its notes were sent in by other banks.

My conclusion based on the experience with national bank notes is that if multiple media of exchange are to be a uniform currency, then the mechanism must place the costs of clearing on some agent or agents, for example the issuer, other than the user. Here I am using clearing in the broad sense of the trade of one medium of exchange for another. Thus, redemption of a medium of exchange – be it a privately-issued bank note or governmentally-issued paper currency under a commodity money standard – is clearing in the sense I am using the term here, as it involves the trade of one medium of exchange for another.

In this discussion of the mechanism that led to national bank notes being a uniform currency, it is important to keep in mind that only national bank notes are being considered: due to the tax on paying out state bank notes described above, national banks were the only institutions issuing bank notes. Without this tax, it is likely that state banks would have continued to issue notes and the United States would not have had a uniform currency. Thus, it may be that I should have included the tax on state bank note issuance as part of

[27] Note that I am discussing the costs of setting up the mechanism that determines the rate at which multiple media of exchange trade with each other. I am ignoring in this discussion the costs of initially setting up the various media of exchange. Establishing a medium of exchange is not without cost. For example, in commodity money systems there is the cost of setting up a mint, and potential sellers face costs in determining the weight and fineness of coins being offered for purchases. In paper currency systems, there are the costs of engraving and printing the currency and of limiting and detecting counterfeits. In fiat money systems, there is a possible further cost due to the necessity of establishing or enacting credible limits to the supply, so that the fiat money will be valued.

the mechanism. I did not because I wanted to focus on the mechanism that led to national bank notes being a uniform currency, not what led to the United States having a uniform currency.

10 Lessons

In the introduction, I stated that the purpose of this research was to use historical experience to determine whether a privately-issued e-money system, with appropriate supervision and regulation, could operate efficiently, and, if the finding was that it could, to see what lessons about the regulation and supervision of a such system today could be learned from the experience of the past.

My conclusion, based on the experience with national bank notes described above, is that a privately-issued e-money system can operate efficiently. However, the evidence also shows that the government would have to play a significant role for efficiency to be achieved, and that the costs of the mechanism put in place to achieve uniformity of the currency will have to be borne by agents other than the users of the e-moneys.

10.1 Ease of transacting and counterfeiting

One way in which national bank notes were not an efficient medium of exchange is that they came in a fixed set of denominations and there was a minimum denomination. These restrictions required that change be made in many transactions, which is inefficient. Obviously, e-moneys would not require denominations, so this inefficiency of national bank notes would not apply to e-moneys.

Another way in which national bank notes were not an efficient medium of exchange is that they were counterfeited. However, there is the potential for counterfeiting for any medium of exchange, whether it be metallic, paper, or electronic, and whether it is privately or governmentally issued. Here there will be a need for the government to play a significant role. Strong laws and enforcement policies by the government and co-operation between law enforcement agencies in different countries will be required. It will also be important for regulators to encourage investment in strong security features, and to encourage co-operation between private e-money issuers to set minimum security features for their e-money products.[28] The costs here will be borne by e-money issuers and taxpayers in general.

10.2 Overissuance

Given the contemporary remarks quoted above, I conclude that the concern with overissuance was the reason for the restrictions on minimum denominations, the requirement that bank notes be redeemable on demand in lawful money, and the restrictions on the quantity of notes that a national bank could issue. National banks could only issue notes up to 100 percent of capital, and in 1870 there was the further restriction that no single bank could

[28]The payment card industry has established the Payment Card Industry Data Security Standard, a proprietary information security standard for organizations that handle cardholder information for the major payment cards.

issue more than $500,000. However, in my opinion the reason there was no overissuance problem with national bank notes is that the United States was on the gold standard during this period.

Even though e-moneys cannot be issued for credit, overissuance could be a concern because their issuance would still increase the quantity of media of exchange in the economy.[29] But little can be learned about the experience with national bank notes on what government regulation and supervision will be necessary to prevent overissuance of privately-issued e-money, because of the different monetary standard in place today. More can be learned by studying the experience with controlling the expansion of demand deposits after 1935.

The regulation of e-money issuers with regard to the quantity of e-money in existence most naturally falls under the purview of a nation's monetary authority. Therefore, the costs will be borne by taxpayers.

10.3 Safety

I define a medium of exchange to be safe if it is completely certain that the liability *of the issuer* will always be fulfilled. Note that I am defining safety strictly in terms of the liability of the issuer, not in terms of purchasing power. Thus, by my definition, specie (gold and silver coins) and fiat moneys are perfectly safe because there is no issuer liability, even though their purchasing power is not guaranteed.[30,31]

The safety of privately-issued e-moneys can be achieved through either of two methods. The first is to have the government intervene and require issuers to back all issues 100 percent with government currency or deposits at the central bank.

The experience with state bank notes and national bank notes shows that this is unlikely to occur. Although both state bank notes and national bank notes were media of exchange with issuer liability, in neither case were banks required to hold 100 percent reserves of specie or lawful money. State bank notes and national bank notes were fractional reserve media of exchange. The free banking laws, which required banks formed under them to hold at least 100 percent collateral against note issuance, only required banks to hold this collateral in the form of state bonds. Similarly, the collateral requirement for national banks was in terms of U.S. government bonds. It was not in terms of specie or lawful money.

The most likely reason that 100 percent reserve requirements were not imposed is that

[29] In terms of the balance sheet of the non-issuer public, what the no credit restriction means is that the new media of exchange are issued in exchange for existing assets, rather than for new liabilities of the non-issuer public. In effect, e-money is monetizing some assets of the public.

[30] Some might argue that Bank of Canada notes or Federal Reserve Bank notes are liabilities of the issuing central bank because they appear on the right-hand side of the bank's balance sheet. I argue that these notes are not a liability of these central banks because the central banks are not required to do anything except hand out another of their notes, which they can create costlessly, when one of their notes is presented for "redemption." In my view, listing a central bank's notes as a liability on their balance sheet stems from the fact that central banks grew out of the tradition of private banks, so that they had to have a balance sheet and, because the notes were not capital and were not an asset but had to be put somewhere, they had to end up as a "liability." It may also be due to the fact that, under the gold exchange standard, central banks were required to redeem their notes in specie, and so their notes were in fact a liability.

[31] Bitcoin could be added to this list of safe media of exchange, although the extent to which it is a medium of exchange can be disputed.

they would have reduced the profitability of issuing bank notes. The same would be true for privately-issued e-money. Imposing a 100 percent reserve requirement for privately-issued e-money would likely result in issuers imposing transaction fees, in much the same way that today there are fees associated with many deposit accounts and with M-PESA issued by Safaricom in Kenya. Further, the existence of such transaction fees would work against privately-issued e-moneys being a uniform currency.

To increase the safety of e-moneys, it would be possible to impose restrictions on how their issuers invest the money they receive in return for their e-money. An example of such restrictions is that issuers of e-money in the United Kingdom must invest in secure, liquid low-risk assets held by a custodian or placed in a segregated account, or, alternatively be safeguarded through an insurance policy or bank guarantee.[32] Replacing 100 percent requirements with such restrictions increases the profitability of e-money issue while still maintaining a high degree of safety for e-moneys. Nonetheless, such restrictions cannot guarantee the safety of e-moneys in all states of the world. The example here is the Reserve Primary Fund, which "broke the buck" in September 2008.

Based on the experience with state bank and national bank notes, my expectation is that privately-issued e-moneys will be fractional reserve instruments. That is, I expect that e-money issuers will have some governmentally imposed restrictions on the assets they can hold, but that they will not be subject to requirements that would insure they would always have assets sufficient to cover their e-money liabilities in a timely manner.

The second method by which the safety of privately-issued e-moneys could be attained is through some form of outside insurance.[33] But does this insurance have to be by the federal government, or could it be done by states, or even privately?

Again, the state bank note experience is informative. No private insurance systems were established. Several states set up insurance arrangements. For example, New York and Vermont set up safety funds to which banks contributed to insure state bank notes. However, in general, these state insurance schemes were not successful. Holders of the notes of banks in the New York Safety Fund that failed had to wait until the state passed a special bond issue to pay them off fully. Holders of notes of one bank in the Vermont Safety Fund that failed suffered losses.

The problem with either private or state insurance is the inability of a private or state insurer to obtain the funds to pay off the insured liabilities in all possible states of the world. Thus, outside insurance of privately-issued e-moneys would have to be by the federal government.

If privately-issued e-moneys are permitted, then I think that they should have federal government insurance right from the start. My argument is as follows. Suppose that there were no explicit government insurance. Given recent central bank interventions with respect to very liquid financial assets, it is my opinion that the public expects that government will step in and bail out the holders of a privately-issued e-money should the issuer fail and be unable to redeem its issues at par. In other words, I think that government cannot credibly commit to not intervene should an issuer of e-money fail, especially if it were a "large" or

[32] Similar restrictions are placed on e-money issuers in Hong Kong. I am indebted to Gerald Stuber for these examples.

[33] By my definition, governmentally-issued e-moneys would be safe since the issuer would only have to fulfill its liability with fiat currency, which it can issue and for which it has no liability.

"systemically important" (too-big-to-fail) issuer. If I am correct, then the insurance should be made explicit and implemented in such a way as to minimize the attendant moral hazard problems.[34]

The experience with national bank notes presents an alternative way of funding federal insurance of media of exchange to that currently used to fund deposit insurance. As described above, insurance of national bank notes was funded in three ways. First, national banks had to deposit collateral with the comptroller of the currency in an amount greater than the amount of the bank's circulation. This collateral was out of the reach of the directors of the bank. Second, the U.S. Treasury had first lien on the assets of the bank. Third, there was double liability of shareholders, and the comptroller did go after shareholders in the case of many national bank failures.

The distribution of the cost of the insurance on the agents in the economy under the scheme used to fund the insurance of national bank notes differs from that under the scheme used to fund the insurance of deposits today. An area for research is which scheme is more efficient, or whether there exists a third scheme that is preferred to those two. Of course, the efficiency of schemes to fund media of exchange insurance will depend on the structure of the issuer. National banks had shareholders that put up capital. The existence of capital permitted the requirement that collateral be posted in an amount greater than circulation, and the imposition of double liability. However, it is possible that privately-issued e-moneys will be more like mutual funds and not have capital, in which case double liability is not possible, although it would be possible to require that managers post bonds. (Double liability could also be impossible politically.)

10.4 Uniform currency

National bank notes were a uniform currency. There was a mechanism in place, one which had a high degree of government intervention and regulation, that made the non-bank public and banks indifferent between the notes of individual national banks and between national bank notes and lawful money.

There are three questions to be considered here. The first is whether such a mechanism could be put in place to make privately-issued e-moneys a uniform currency. The second is whether such a mechanism would be put in place. The third is whether it is efficient to do so.

In using the experience with national bank notes to consider these issues with respect to e-moneys, two big differences must be kept in mind. The first is that the information-conveying potential of e-moneys could be vastly greater than that for national bank notes.[35] National bank notes were pieces of paper that conveyed only two pieces of information: (i) that the holder had somehow managed to obtain the note, and (ii) the name of the issuer of the note. E-moneys, because they are digital instruments, have the potential to convey more information about both the holder and the issuer. For example, they could contain a great deal of information about the transactions history of the user.

[34]There are many ways in which this could be done. One would be to have the e-money holder bear the first, say, $100 of any losses, although this would make the e-money less than perfectly safe.

[35]The seminal paper on money as information is Kocherlakota (1998).

The second difference with respect to e-moneys is that the hardware requirements in order for multiple e-moneys to be a uniform currency are greater than those that were required for national bank notes. When there are multiple media of exchange, sellers (merchants, suppliers, etc.) must accept all of them at par for the media to be a uniform currency. For national bank notes, no hardware was required for this to occur. Sellers could simply accept the notes of different national banks at par knowing that they could use them to pay off debts at their bank. The case of e-money is more complicated. Sellers would need the capability to put issuer A e-money they received in payment on an e-money A device, that issued by issuer B on an e-money B device, and so on. Further, they would need the capability to spend these various e-moneys, so they would need to be able to transform e-money on these devices into a form that could be transferred to others. Of course, there could be a device that accepts multiple e-moneys, but this seems unlikely unless there are only a small number of issuers, because of the costs of maintaining the network that would be required.

With regard to the first question, of whether a mechanism could be put in place to make privately-issued e-moneys a uniform currency, my answer is that it could. While such a mechanism would very likely share some aspects of the mechanism that made national bank notes a uniform currency, it is likely that the mechanism would have far more restrictions on the permissible actions of issuers because of the informational differences between national bank notes and e-moneys.

With regard to the second question, of whether a mechanism would be put in place to make privately-issued e-moneys a uniform currency, my expectation is that it would not and that privately-issued e-moneys would not be a uniform currency. Because e-moneys could contain a large amount of information about the holder and the issuer, there would be strong incentives for e-moneys to not trade at par in all transactions between members of the non-issuer public, or in transactions between the holders of an e-money and the issuer. Some examples of the form that such incentives might take are the loyalty points currently given by many credit card issuers when their cards are used in certain types of transactions. If e-moneys were to be a uniform currency, such incentives would have to be prohibited as part of the mechanism. The difficulty is that there are many forms such inducements can take. One example is the non-monetary inducements (toasters are the prime example) that were given for opening deposit and savings accounts when the interest rates that could be paid on them were held down by the Federal Reserve System's Regulation Q. My expectation is that if there are profits to be made from issuing non-uniform currency e-moneys, private issuers will find a way around any rules that are put in place.

There is another possible reason that a mechanism would not be put in place to make multiple privately-issued e-moneys a uniform currency. Suppose that there were a need for the e-moneys of different issuers to be cleared. For example, there was a need for interbank clearing with national bank notes because of the restriction that national bank notes could not be used as reserves. If there were features of the e-moneys that could potentially make issuers not indifferent between individual e-moneys and lawful money, then the mechanism to make e-moneys a uniform currency must work to make users indifferent among them despite the restrictions. The government could set up such an e-money clearing facility with costs borne by issuers, as was done with national bank notes. However, the experience with credit card clearing suggests that the costs are likely to be borne by those presenting the

e-moneys for clearing, rather than the issuer, much as occurred with state bank notes.[36]

With regard to the third question, of whether e-moneys should be a uniform currency, there are two views. The view that they should be is well expressed by Rolnick (1999, 675), who states, "Although some might argue that nonpar circulation of private currencies is not a problem, achieving a uniform currency has historically been thought to be an important element of a well-functioning economy." However, Chiu and Wong (forthcoming) have the opposite view. They argue that because e-moneys can convey more information than traditional moneys, they are fundamentally different from traditional moneys. Thus, the arguments as to why traditional moneys should be uniform currencies do not necessarily apply. Instead, an optimally-designed monetary system may have non-linear pricing or may restrict some persons from engaging in certain transactions.

11 Areas for Future Research

There are several questions concerning e-moneys that deserve a great deal of future research. On the theoretical level, one is the optimal design of an e-money mechanism. A related question is whether, given appropriate government supervision and regulation, an optimal, or close to optimal, e-money system can be implemented with privately-issued e-moneys, or whether a governmentally-issued e-money will be required either as an additional e-money or to the exclusion of privately-issued e-moneys.

Currently, all countries have media of exchange systems, but the number of countries with privately-issued e-money-like systems and the use of such systems is quite limited. There is no case in which a privately-issued or governmentally-issued e-money system has replaced the more conventional monetary systems. This suggests that if e-money systems are established, whether private or governmental, they will be additions to the current systems. This gives rise to two additional areas for future research. The first is to determine whether there are some market failures in current media of exchange systems and whether an e-money system can be designed to address some or all of these failures. The second is to take the current media of exchange system as given and then determine the welfare effects of, and the gainers and losers from, the introduction of e-moneys and the possible regulations under which they might operate.

[36]History provides an example of when such a facility was set up privately: the Suffolk Banking System run by the Suffolk Bank in Boston. It was a net clearing system for notes issued by state banks in New England between 1825 and 1858. The clearing costs of this system were borne by issuers in the sense that members of the system had to maintain a non-interest bearing specie deposit with the Suffolk Bank, which it then used to make loans on which it alone received the interest. However, it appears that this was an unusual case, since such systems were not set up elsewhere in the United States at the time.

Appendix: National Bank Organization and Reserve Requirements for Deposits

National banks were divided into three classes, depending on their location. The first class of banks were central reserve city banks. Originally, only banks in New York were central reserve city banks. Later, banks in Chicago and St. Louis were also designated as central reserve cities. Central reserve city banks were required to hold 25 percent of the amount of their notes and deposits on hand as reserves. The second class of banks were reserve city banks. Originally, 16 reserve cities were named in the National Banking Act. However, cities were added to the list of reserve cities. For example, by 1907 there were 40 reserve cities.[37]

Reserve city banks were also required to hold as reserves 25 percent of the amount of their notes and deposits. However, they could hold up to 50 percent of their required reserves as deposits at central reserve banks. The third class of banks, so-called country banks, were those not in a central reserve city or a reserve city. Country banks were only required to hold reserves against 15 percent of their notes and deposits. Further, they could hold 60 percent of their required reserves as balances at a reserve city bank.

[37] At least one city lost its designation as a reserve city. Leavenworth, Kansas, appeared on the list in the original act, but not in the 1907 list.

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